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# EVOLUTION

AND

## HUMAN ANATOMY.

BY

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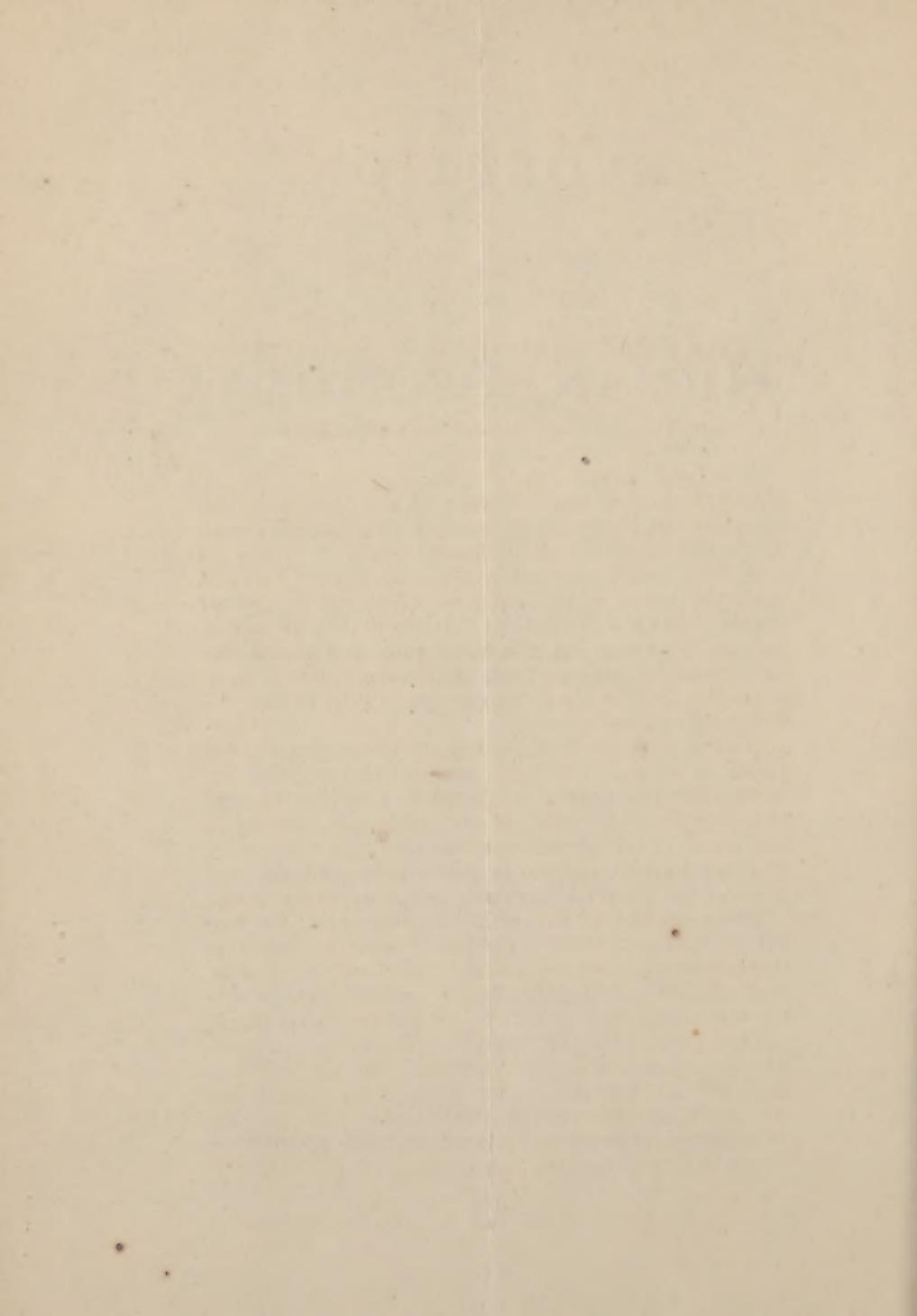
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## EVOLUTION AND HUMAN ANATOMY.

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"In the place of miracle, natural science has substituted law."

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THE "Descent of Man" closes with the once startling assertion, that "man still bears in his bodily frame the indelible stamp of his lowly origin." If this be true, then man's conception of an ever-loving and all-merciful God would be based on a benevolent reality, rather than on a malevolent fiction; since man would belong to a risen, not to a fallen race, and should exchange a discouraging belief in his degradation from a perfect parent for an encouraging faith in his own progressive development.

No one familiar with the history of the warfare between science and religion will be deterred from investigating the proofs of Darwin's assertion, though it is denounced by bibliots as "evidently contrary to Scripture;" for, such denunciations recall the history of many similar contests, of which three, at least, cannot, for the good of mankind, be too often repeated.

The rotundity of the earth was denounced for centuries "as contrary to Scripture,"\* and the believers thereof were cursed and punished as "heretics, infidels, and atheists"—until Magelhaens, sailing ever in one direction, returned in 1519 to his point of departure.

The Copernican doctrine—that the planet of vain-glorious man was not the centre of the universe, but that the sun was the centre of our system, and that the earth moved around this centre, not the sun around the earth—was declared, in 1616, by the Cardinals of the Roman Inquisition, to be "absurd,

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\* See Is. xl. 22; Ps. lxxiv. 17; cxxxv. 7; Jer. ii. 16; Rev. vii. 1.

heretical, and contrary to Holy Scripture." The great book, which, in 1543, first taught this now familiar truth, was condemned to remain on the Roman "Index Librorum Prohibitorum" from 1616 to 1820. For advocating this truth, Bruno was burned, Campanello tortured, Galileo terrified into perjury; and Luther and Melancthon joined hands with the Pope, uniting Protestantism to Catholicism in upholding as scriptural \* the woful ancestral errors, to the overthrow of which Copernicus and Galileo owe their undying fame.

For centuries the creation of "the heavens and the earth" within six days † was an article of religious faith requisite to man's salvation. Even in 1850 the great Christian scientist, Agassiz, deemed it necessary in his geological lectures at Harvard, to explain and apologize to an audience of college-boys, for teaching that the works of the Creator buried in the bowels of the earth testified irrefutably that it could not have been made within six days; and to defend himself against the maledictions hurled against him by that pulpit and press, which accepting at last the lesson once fiercely denounced, now uscs his great, but at one time execrated name, to wage an equally hopeless battle against the doctrine of evolution. The only doctrine which explains to the biologist the Creator's mode of action in accord with such well-known facts as: that useful animals are burdened with useless organs, and harassed by other animals, useless and noxious; that organs and organisms are modified by, and are adapted to the varying conditions of existence; that use causes development, disuse the atrophy of organs, and thus new organisms may appear, while old ones may disappear; and that nature's work is done through laws simple, uniform, and constant.

It would be presumed, that the marks of man's lowly origin, stamped indelibly upon his bodily frame, should be familiar to, at least, physicians, since they are forced to study human anatomy. But, in truth, few physicians, even though skilful anatomists, are

\* See Josh. x. 12, 13, 14; Mal. i. 11; Ps. civ. 19; cxlii. 3; Is. xxxviii. 8; Ee. i. 5; Hab. iii. 11.

† See Gen. i. 31; ii. 1, 2.

well informed on this subject, for the reasons, that they pursue anatomy for practical purposes, not for philosophical deductions; that they study superficially, if at all comparative anatomy, on which depends the significance, so far as evolution is concerned, of human anatomy; and that the indelible marks of man's lowly origin are to be found chiefly in three directions, of little importance to, and, therefore, little studied by the medical anatomist. These three directions are: the anatomy of the human being while within the womb—embryology; the anatomy of bodies deviating from the common rule—anomalies; and the anatomy of certain parts—rudimentary organs—imperfect in and useless to man, but perfect in and useful to lower animals. In these three neglected departments of anatomy will be found in abundance the indelible marks of man's lowly origin. Some of these will now be presented under the headings: Embryology, Anomalies, and Rudimentary Organs; however, every example presented will not be strictly confined to its appropriate heading, because the three subjects are so related that often an example of one is strengthened when united to an example of the other. This close relationship is so marked between embryology and anomalies, that the classification of monstrosities, which are simply gross and hideous anomalies, is based upon embryology.

#### EMBRYOLOGY.

If the different stages of man's development within the womb be not a synopsis or recapitulation of his genealogy during the enormous duration of terrestrial life—then these progressive stages are not only inexplicable, but also are so deceptive as to suggest the same explanation, once current as to fossils—that they were “delusions of the devil.”

Man, “in action, how like an angel! in apprehension how like a God! . . . the paragon of animals,” originates, not, as our ancestors taught, from a homunculus or diminutive baby, but from a little ovule or cell, as does a fish, frog, snake, bird, and dog; it is about  $1\frac{1}{2}$  inch in diameter, and apparently dif-

fers in no respect from the ovules of other mammals. In the hatching of this microscopic egg it successively presents in striking particulars the same forms of animal life disclosed in the successive strata of geology, and taught in our school-books as the five progressive steps from the lowest to the highest vertebrates; for, the human embryo, at first invertebrate, subsequently assumes, in many things, the organization of a fish, an amphibian, a reptile, and a mammal, while becoming man-like—and yet has never ceased to be a human being. At the third week of hatching, this future man is a gelatinous worm-like body, and even at the eighth week can scarcely be distinguished from the embryo of a dog. Among the details of this gradual development, the following deserve attention; but, to appreciate them, a comprehension of some facts in the development of lower animals is indispensable:

An egg, to grow, must, like every living thing, have air, water, and food for nutriment. How are these supplied? In all vertebrates, blood-vessels, always the conveyers of nutriment, sprout from the microscopic embryo within the yolk or vitellus, and, extending over its surface, form a "vascular area," which conveys to the embryo all such nutriment as the water or air outside of this area may bring in contact with it, and also the nutritious yolk inside of this area: as the embryo thus consumes the yolk, this constantly diminishes, so that the vascular area gradually becomes a sac, which is called the "umbilical vesicle." The blood-vessels constituting first the vascular area, then becoming the vessels of the umbilical vesicle, form what is called the vitelline circulation, which, though the primary circulation of every vertebrate, is transient, disappearing by atrophy as soon as the yolk has been consumed, and other organs have been developed to supply the ever indispensable air, water, and food. This vitelline circulation supplies with nutriment the embryo of a fish, and of its brother frog, until converted into a minnow or a tadpole, when the sufficiently developed alimentary canal, and gills or branchiæ provide the requisites for additional growth.

The egg of a bird and of a reptile is at first nourished by the same vitelline circulation which suffices to convert an embryonic into a perfect fish ; but, long before the hen's egg becomes a chicken, this primary circulation begins, inexplicably to the special creationist, to disappear, while two new organs are developed—the amnion, with the more important allantois, which supply the embryonic bird and snake with a *secondary* circulation, in place of the disappearing *primary* one of the fish and frog. Thus, the hen's egg is provided with air and food until it becomes a chicken, when alimentary canal and lungs (not gills) discharge permanently outside the egg the functions discharged transiently within the egg, first by the vitelline, and second by the allantoidal circulation.

How grows the mammal's egg ? As grows the egg of a woman. The human embryo is, by the "after-birth" or placenta—which is formed in large part by transformation of the allantois, first into the chorion, then into the placenta—grafted upon the mother's womb, and derives its nutriment from the blood of the mother. But, it must always remain an inscrutable mystery to the special creationist, that the Omnipotent delays thus to graft the embryo upon the mother until about the fourth month, and insists on forcing the human and every mammalian egg to secure its nourishment: first, through the fishy and amphibious vitelline circulation, which, quickly disappearing, is replaced by the allantoidal circulation of the reptile and bird—which second circulation also quickly disappears to be replaced by, third, the placental circulation. Now, let it be observed, that, on the one hand, the vitelline circulation of the fish is bathed in water, thence obtaining air in abundance, and that the allantoidal circulation of the snake is in contact with the delicate porous egg-shell, through which air is readily absorbed ; while, on the other hand, these two circulations in the human embryo are in contact, not with water nor with the external air, but with only one air-providing menstruum—the fluids secreted by the mother's womb—fluids which provide air, as also food, much less perfectly than is subse-

quently done by the blood of the placenta. Why then should the human embryo be furnished *temporarily* with the embryonic organs, first of a fish and amphibian, and then of a reptile and bird, prior to the development of the mammalian placenta—unless these organs, less perfect and more transient than the placenta, be indelible marks of man's hereditary descent? The student of vital phenomena cannot ignore the important purport of "the appendages of the embryo" and of the elementary facts now stated—facts, which become of convincing significance when associated with those now to be presented.

The vitelline circulation is, by no means, the only indelible mark of man's piscine ancestry. Not until the sixth week does that *gill-apparatus* disappear, which, permanent in fishes, is transient in the embryos of reptiles, birds, and mammals. The human embryo has on each side of the neck, as has an adult fish, "branchial arteries" (five), distributed to cartilaginous "branchial arches" (four), which have between them "branchial fissures" opening into the pharynx. From the "branchial arteries" of most fishes are developed, for aquatic respiration, numerous vascular "gill-fringes" by which the air, dissolved in the water pouring through the "branchial fissures," is absorbed. But "gill-fringes" are useless to animals which do not breathe in water, and since disuse of these fringes should cause their atrophy in a human embryo, just as it *does* in a tadpole, it is in perfect accord with nature's laws that these gill-fringes are not present in the human embryo; even in some fishes they are dispensed with. In further evidence that the embryonic branchial apparatus is perfectly homologous with the permanent gills of fishes it is found that, as the arterial system of the fish is formed from its branchial vessels, so the arterial system of the human embryo is formed from its branchial arteries—all of which gradually disappear by a conjoint process of atrophy, and of transformation into man's permanent arteries. Man's embryonic "branchial fissures," through which, in fishes, the air-supplying water passes off, also undergo transforma-

tion; however, as an anomaly, "original branchial fissures may persist in the neck, even in adults."\*

Man's lungs are first developed as two little sacs, which, prior to the development of the trachea or windpipe, open temporarily, as the air-sacs of fishes permanently do, into the upper part of the alimentary canal—usually into the pharynx.

Man's embryonic heart is at first a simple tubular pulsating sac, like that of the lowest vertebrate—that exceptional and wonderful, heartless, and brainless fish, the lancelot or amphioxus. This single sac is soon divided by a septum into two sacs, and thus man has temporarily the two-chambered permanent heart of fishes. This piscine heart soon becomes a three-chambered reptilian heart, distributing, like it, impure venous mixed with pure arterial blood.† This snake-like heart does not become the perfect heart of the bird, mammal, and man, with its four completely separated cavities, until several days after birth; and, as an anomaly, the three-chambered heart may persist in man, causing the well-known "blue disease." As another peculiarity of the vascular system, man has but one great vein—the superior vena cava—to return the blood from the upper part of his body to the right auricle of the heart; but in his early embryonic condition, "two superior venæ cavæ open independently into the auricle. This condition remains permanent in birds, and in some of the lower mammalia, which possess both a right and a left vena cava superior, opening separately into the right auricle. Instances are occasionally met with, from arrest of development, of two such veins in the human body."‡

The "Wolfian bodies" are the permanent kidneys of the fish, and of his immediate descendant, the frog; but, they constitute only the "false" or "primordial kidneys" of higher animals. The human embryo possesses them until about the third month, when

\* Page 953, Vol. IV., Cyclop. Anat. and Phys.

† The reptilian heart has only one ventricular, and two auricular cavities; while the human embryonic heart has only one auricular, but two ventricular cavities.

‡ Marshall's Physiology, Am. Ed., p. 977.

they disappear by atrophy, giving place to the permanent true kidneys. These are in man smooth and unlobulated, but are lobulated in lower animals—so they are in the human embryo, and, as a frequent anomaly, this lobulation may persist in the adult man.

Fishes, amphibians, reptiles, and birds, are *cloacal*, that is, have one common fecal and uro-genital outlet; so, the human embryo is cloacal to the twelfth week of its existence. The urachus, a relict of the allantois and of this cloaca, running from the bladder to the navel, is in some animals a pervious duct. “It has been found (says Wilson’s Anatomy), pervious in the human foetus,\* and the urine has been known to thus pass through the umbilicus.”

The “descent of the testicle” from the abdomen of the foetus is by a pouch continuous with the peritoneal sac of the abdomen. This continuity, permanent in many lower animals, as in the rabbit, is habitually temporary in man; but may as an anomaly, persist, and thus cause the well-known “congenital inguinal hernia.” Farther, this “descent of the testicle” is guided by a muscular cord, the gubernaculum testis, which at birth has lost its muscular character, and become (teaches Dalton’s Physiology), “merely the anatomical vestige or analogue of a corresponding muscle in certain of the lower animals, where it has really an important function to perform” throughout adult existence.

The early embryonic womb appears bifid, and internally “presents a strongly marked triangular form, the vestige of its original division;” and, as anomalies, women may have not only “two-horned,” but even “double wombs.” Now, in apes, the womb is slightly notched, and, therefore, more distinctly bifid than in women; in cetacea, solipeds, and ruminants, it is distinctly “two-horned;” and marsupials, as well as some rodents have a “double-womb.”†

The placenta is formed in part by the mother, and in part by her offspring—in women these two parts

\* The human being is termed embryo, until the beginning of the intra-uterine fourth month, and from this date to birth is called foetus.

† Marshall’s Physiology, Am. Ed., p. 974.

are eventually soldered inseparably together; but in the earlier stages of development these parts are separable, as is always the case in the cow and other animals. The fetal part of the placenta is formed by numerous vacuolar tufts of the chorion, called cotyledons, which in woman are soldered together into the smooth, single "discoid placenta;" but in ruminants the cotyledons continue separate, and they have habitually a "cotyledonous placenta;" as an anomaly, a woman may have a cotyledonous, instead of the usual discoid placenta.\* The human foetus is born linked to the placenta by the umbilical cord, which contains two umbilical arteries, and only one umbilical vein; but in the earlier stages of development there are two umbilical veins, which, always present in some lower animals, as (Topinard) in Cebian monkeys, may, as an anomaly, persist in the human foetus.

Man's nervous system originates in a cord having one anterior bulbous enlargement, as is the permanent form of the cerebro-spinal axis of the amphioxus. This single bulb, first separating into the "three cerebral vesicles," subsequently develops man's complicated brain. Thus, as in the successive classes of vertebrates, so in the successive phases of the human embryo's life are found developed all stages of the nervous system, from the simplicity of the amphioxus to the complexity of the highest mammal. Man's brain possesses no parts not present in the brains of the highest apes; † it differs from theirs, not in quality, but in quantity—in the greater complexity of the convolutions, in the lack of symmetry between the two sides, and in the greater size. But, our convolutions do not begin to be developed until the fifth month— even at the seventh month of fetal life, man's brain is as unconvoluted, and as symmetrical as is the adult baboon's; and, as anomalies, human beings may be born as destitute of brain as is the amphioxus—and the brains of congenital adult idi-

\* Cazeaux: Midwifery, Am. Ed., p. 195.

† The highest apes, anthropoids, or anthropomorpha, are the gorilla, gibbon, chimpanzee, and orang.

ots, seldom weighing more than twenty-three, may not exceed even eight and one-half ounces—while the average weight of the gorilla's brain is about seventeen ounces.

Man's bony system passes through a cartilaginous stage, which, temporary in him, is permanent in some fishes; and our bones present other indelible marks of our lowly origin, besides those which follow.

The single adult frontal bone (forehead) consists in lower animals of two separate pieces: such is its condition in the human embryo, and these two frontal bones are not united until the first year after birth,—as an anomaly, this union may never take place.

In some apes and other mammals the malar, or cheek-bone, is permanently divided in two portions; and this sometimes occurs in the human embryo.

Lower animals have a distinct inter-maxillary bone for the incisor-teeth of the upper jaw; so to the fourth month has the human embryo. The final union of the inter-maxillary with the superior maxillary bones is marked by a fissure for some three years after birth, and, by arrest of development, may never take place, thus causing, as an anomaly, the well known deformity—hare-lip.

In the human embryo, "at one time, the two nasal passages or fossæ are closed at the bottom, a condition which is permanent in fishes; afterwards they communicate, in front of the palate, with the mouth, as in certain amphibia; finally, they open only into the pharynx, as in reptiles, birds, and mammals."\*

In the human embryo the great toe is shorter than the others, and farther from them, even projecting at a right angle, as is its permanent condition in the quadrupeds.

To the eighth week the coccygeal or tail-bones of the embryo man project beyond the rudimentary legs, and as far beyond as in the embryo dog. This veritable tail, though usually aborted, may, as an anomaly, persist, as shown by Mr. Owen, who, April 25th, 1878, related to the Royal Society of London "a

\* Marshall's Physiology, Am. Ed., p. 965.

case of a foetus he saw, which had a tail that was *covered up in one button* and *distinctly moved*. It was successfully removed by ligature, and was now in the museum of Guy's Hospital. The child lived to sixteen years of age."\* That the coccyx is an indelible mark of a true ancestral tail, is further indicated by the presence, even in the adult, of muscles which formerly moved it, but which, by long disuse, have atrophied and become rudimentary."†

Finally, the poetical seven stages of man's life outside the womb are even surpassed by those within it, as multiplied by embryologists. The most striking of these embryonic stages are, the Ascidian, the Amphioxian, the Piscine, the Reptilian, the Mammalian, the Quadrupedal, and the Human. What theory, other than evolution, offers even an attempt to rationally explain the significance of these stages, and of the facts now presented?

#### ANOMALIES.

Anomalies are deviations from the habitual construction of the body; the grossest are termed monstrosities, others constitute deformities, while the greatest number are simple deviations without being, in any wise, malformations. Most anomalies represent anatomical structures habitually found in lower forms of life, hence constitute what evolutionists term *reversions*. Examples of monstrous, then of ordinary anomalies, will now be given.

A monster is not, as until recent times was taught, an instance of "divine vengeance," nor a "weak of the devil," nor a result of bestial intercourse, nor a *lusus naturae*, nor the product of a creative force of special kind; but is due sometimes to excessive, sometimes to perverted, or, far more frequently, to

\* Dr. Medl. Jour., May 11, 1878, p. 680.

† Gray's Human Anatomy, Am. Ed., p. 228, says, "the extensor coccygis is a slender muscular fasciculus, occasionally present, . . . it is a rudiment of the extensor muscle of the caudal vertebrae present in some animals."

‡ Human monsters are reported by some to occur as often as once in every 1,600, and by others once in every 3,000 deliveries. Fortunately many die early.

defective embryonic development. Since the transient forms of the human embryo are, for the most part, repetitions of the persistent forms of lower animals, it is not singular that malformations due to arrested development should present a brute appearance; nor is it singular that our ancestors, ignorant of embryology, should long have erroneously ascribed beast like monsters to bestial intercourse, and that this error should still find credence among the ignorant.

The human embryo is, in its earliest stages, as destitute of head, brain, heart, and extremities, as are the permanent forms of many lower animals; hence, from arrest of development, a human monster may be born as headless as a worm, as brainless, and heartless as the amphioxus, and as limbless as a snake. Every variety and degree of deficiency in these and other parts, from complete absence to perfect development, may occur. Not only may development be arrested prior to the separation of the head from the trunk, thus producing a headless monster, but there may be a partial arrest producing a brutish, frog-

ke deficiency of neck; not only may the four extremities be all wanting, as in the worm and snake, but the hands or feet may, turtle like, be attached to the shoulders or pelvis, and the two lower extremities may coalesce into one, as in fishes. Man's embryonic eyes are at first located on as diametrically opposite sides of the head as are the eyes of fishes, or of rodents; hence, by defect of development, may result human monsters, thus hideously deformed.

Before citing other examples of anomalies it is well to recall, that in addition to the above monstrosities, some fourteen instances of ordinary anomalies have already been presented in connection with embryology. To this list of reverions may be added the following indelible marks of man's lowly origin:

The vast majority of flowering plants, and also many inferior animals (as tape-worms, slugs, snails, etc.), are "double-sexed," and it is now generally conceded that *true* hermaphroditism is, in man, "not only possible, but probable."

Many lower animals have a "penial bone," and as a relic of this "a prismatic cartilaginous body has been occasionally found in the centre of the glans" penis of man.\*

Instead of having one nipple to each breast, or mamma, a woman may have, like some lower mammals, additional supplementary nipples; and her mammae may, like the Monotreme's, be destitute of nipples. A woman may have, instead of the usual two pectoral mammae, supplementary mammae sufficient to furnish her with five breasts; she may have on the belly, the abdominal mammae of Marsupials, or in the groin, the inguinal mammae of Ruminants. She may have, like the Lemur, the lowest animal of man's order, the primates, two pectoral, and two inguinal mammae. Among all mammals a marked relation exists between the number of mammae and of young at one birth; and it is found that a woman may have occasionally, as some lower animals have habitually, two and even five living young at a birth.†

Man has occasionally a supplementary spleen, which is constant in the sturgeon, dolphin, narwahl, and doubtless in other animals.‡

Many birds have a "vitelline caecum," that is, a pouch-like process, or a "short, narrow, blind diverticulum, connected with the small intestine;" "a similar diverticulum is occasionally found in mammalia, and even in man."§ Man may be web-fingered and as web-toed as a duck, and he may have two toes occasionally webbed, as they constantly are in the gibbon.

In man there is occasionally a simian conformation of the cartilage of the ear ("square above, rounded off, and without a lobule"); he may be born as desti-

\* Huxley's *Vertebrates*, p. 417.

† Churchill reports that in 448,988 deliveries, twins occurred once in 78, and triplets once in every 5,831 cases.

To correct frequent misapprehensions of two sexual questions, it may be here added, that Flint's *Physiology*, p. 875, teaches that monkeys, as well as women, have a monthly catamenial discharge; and Topinard's *Anthropology*, p. 150, teaches that the gorilla and chimpanzee are monogamous.

‡ Mivart's *Element. Anat.*, p. 484.

§ Marshall's *Physiology*, Eng. Ed., p. 187, v. 2; and p. 622, Wilson's *Anatomy*.

tute of external ear as a fish, frog, or snake, and as eyeless as a fish from the Mammoth Cave.

Like Esau, and many more recent instances, man may be as hairy as are most of his mammalian ancestors; and, he may have, instead of ordinary nails, as solid claws on fingers and toes as have the Carnivora.\*

Anomalies of the bones are numerous. There may be complete fusion of the two parietal bones into one, as in rodents; and there may be, as in some lower animals, an interparietal bone. In the white race the two bones proper of the nose remain separate to an advanced age, as is not the case in other animals; but their fusion may occur early, especially in the inferior races of man, as for instance in Hottentots about the twentieth year; while in the chimpanzee and gorilla it occurs about the second year.† The spinous processes of man's 3d, 4th, 5th, and 6th cervical vertebrae are habitually bifid, but they are, especially in the inferior races, sometimes simple, as they constantly are in lower animals; however, the chimpanzee has two of these processes bifid, thus presenting in this particular a *transition* form. Man has occasionally, instead of his habitual twelve dorsal and five lumbar vertebrae—the thirteen dorsal and four lumbar vertebrae of the gorilla and chimpanzee; or the twelve dorsal and four lumbar vertebrae of the orang. Instead of twelve, man may have the thirteenth rib, out of which Eve was conjecturally made, and which some lower animals habitually possess.

Many animals have—to protect the principal artery and nerve of the humerus from compression—a "supra condyloid foramen," which is occasionally found in man, it is said, once in every hundred cases; still more frequently is found a small hook-shaped process, as a rudiment of this foramen.†

In some fishes and crocodiles, says Mivart, several successive series of new teeth appear to replace old

\* In 1864 one such case was seen by the writer, at Macon, Ga., in a Confederate conscript, who stated that his long, round, solid claws were inherited, and had been transmitted to one of his children.

† Topinard's Anthropology, p. 127.

\* Gray's Anatomy, Am. Ed., p. 131, teaches that this foramen, or its rudimentary hook-like process, are, when present, found "some two inches above the internal condyle."

ones; so, occasionally in man, there may occur a third, and perhaps even a greater number of series of new teeth.

Occasionally in the superior, frequently in the inferior races, man's lowly origin is stamped upon him by the projecting upper incisors of the anthropoid, by his prognathous under-jaw, and by his monkey-like "facial angle."

A man has more than five hundred separate muscles; variations in number and attachment are frequent, particularly in negroes\*; and these variations or anomalies constantly illustrate reverions to lower animals, and especially to the anthropoids. Topinard asserts that the sternal muscle of mammals is present in 18 of 600 men; that the ischio-pubic muscle, constant in the majority of male animals, is present in 19 of 40 men; that the levator claviculae of most apes is present in 1 of every 60 men; that in one man, seven muscular peculiarities of certain apes have been found; and that a marked muscular peculiarity of anthropoids and monkeys, as distinguished from men, is the habitual presence in the former and absence in the latter of an accessory fasciculus of the latissimus dorsi, but that this fasciculus has been "observed in a rudimentary state in some negroes."\*

Huxley teaches,† that man has usually only two muscles,‡ which the anthropoids do not have, but that the one is sometimes, and the other is frequently wanting in man; that the anthropoids have usually only four muscles,§ which man does not have, but that all these are sometimes absent in anthropoids, and present in man; and, in fine, that "all the apparently distinctive peculiarities of the myology of the anthropomorpha are to be met with occasionally, as varieties in man."

\* Topinard's Anthropology, p. 93. However, Gray's Anat., Am. Ed., p. 272, teaches that an accessory of the latissimus dorsi is found in one of every 13 men.

† Huxley's Vertebrates, pp. 408, 417.

‡ The extensor primi internoe pollicis, and the peronaeus tertius.

§ The levator claviculae, dorso-epitrochlearis, scansionius, and abductor ossis metacarpi quinti digiti.

## RUDIMENTARY ORGANS.

Rudimentary organs found in all kinds of plants and animals, are the perfectly useless, and at times, even detrimental, relics of useful organs in lower forms of allied plants and animals. The presence of such relics in the adult, and their better development in the embryo, are among the most convincing evidences of evolution; while to him who believes that all things were specially created for some special and useful purpose, these relics must continue to always be "inscrutable mysteries." How is it possible to explain, except by the *derivative* creation of evolution, such facts as follow?

The canine and upper incisor-teeth of ruminants exist in a rudimentary state, but are invisible, because they never rise above the gum; so also, the fetal whale has teeth which are never cut. Many insects have wings; lying under wing-cases which are firmly soldered together. Even entire limbs may be rudimentary—certain snakes having hind-legs hidden beneath the integument.\* There often reappear the stump of a tail in tailless breeds, minute dangling horns in hornless breeds of cattle, the vestige of an ear in earless breeds, and the rudiments of eyes in eyeless animals.

The rudimentary organs of man, if neither so surprising nor so numerous as in lower animals, are as significant. To the several examples heretofore presented will be added the following:

The porpoise, the hedgehog, horse, and other brutes, have a highly developed group of skin-muscles, termed the *panniculus carnosus*—which is rudimentary in man, being represented only in part; for instance, by the *platysma myoides* in the neck, by the *occipito-frontalis* over the skull, and by occasional traces in the arm-pits, and other localities. The fibres of the *rectus* muscle of the abdomen are interrupted at intervals by from two to five transverse ten-

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\* Dalton's Physiology, p. 614, teaches that the anterior extremities of the embryo-frog are at first concealed beneath the integument.

dimous intersections - termed *lineæ transversæ*, which are the vestiges of ribs in some mammals, and especially in reptiles.\* Although few men can move the external ear, and even these imperfectly, yet all men have three rudimentary ear-muscles,† which are the analogues of large and important muscles in some of the mammalia. A small projection, sometimes found on the superior border of the helix of man's ear, is believed by Darwin to be the vestige of an ancestral *pointed ear*.

Man, and all male quadrupeds have rudimentary mammae, which, considered in connection with "double-sexed" anomalies, have, no doubt, a deep significance. Man has, over the whole body, rudimentary hairs, which are supposed to be vestiges of a uniformly hairy coat. Man has a small laryngeal sac, the ventricle of the larynx, which is believed to be the rudiment of a very large cavity in anthropoids, and in other animals. The white man's third molars, or wisdom teeth, are sometimes never cut, are especially prone to decay, have only one root instead of two or three, and are smaller than the first and second molars; since this is not the case in lower animals, nor in apes, nor in the inferior races of man, it is believed that the European's wisdom-teeth are *tending to become rudimentary*.

In mammals generally, and in lower vertebrates, there is present in each eye a "nictitating membrane," or "third eyelid," which often, if not always, springs from the inner and nasal side of the eyeball; in the same part of man's eyes is constantly found, as a rudiment of this third eyelid, the *semilunar fold*, or "*plica semilunaris*."‡

One of the best known, and most remarkable of the rudimentary organs of man, is that worm-like ap-

\* Mivart's *Element. Anat.*, p. 239, says, "The *lineæ transversæ* may be absent, as in the hedgehog, etc.; or they may be seven in number, as in the raccoon, or they may be replaced by regular abdominal ribs, which subdivide the rectus into a longitudinal series of successive segments, as in the chameleon."

† The *attolens*, *attrehens*, and *retrahens anris*.

‡ In dogs, cats, and carnivora generally, the eyelids do not separate from each other until eight or ten days after birth, and in the human *fœtus* they remain adherent to the seventh month.

pendage to the cæcum, or head of the large intestine, called the appendix vermiformis cæci. The highest apes, and, it is said, the marsupial wombats, are the only animals which share with man the honor of possessing this curious and useless organ—which serves no purpose, thus far conceived by human ingenuity, except either to occasionally cause death, as by impaction of a cherry stone, or to present a very indelible mark of man's lowly origin. To properly estimate this cæcal appendage, a few facts in comparative anatomy must be understood.

The cæcum is a pouch-like elongation of the large intestine at its junction with the small intestine. The ant-eater and armadillo have, as birds generally have, two such blind elongations, or a "double cæcum;" the manatee has a bifurcated cæcum; but mammals, as a rule,\* have only one cæcum, which always large, may be of enormous size, as in the hare, the indris, the marsupial koala, the horse, and in ruminants. The cæcum of the koala is three times the length of its body, while that of the horse is longer than three feet, and holds more than seven gallons. Farter, lemurs have a peculiar cæcum, in that, it is "drawn out into an elongated conical termination;" and some, if not all, carnivora, have a "spirally twisted" cæcum.†

These facts seem to throw light on the gradual transformation of the large mammalian cæcum into man's insignificant organ,‡ which has attached in re-to a small, elongated, worm-like, conical, and spirally twisted appendix. Can any doubt remain that this appendix is the vestige of the long and large cæcum possessed by man's mammalian ancestors? If so, the doubter is required to explain why it is that

\* Human anatomists habitually assert or imply that all mammals have a cæcum; but, Mivart's *Element. Anat.*, pp. 447-8, teaches that "the presence of a cæcum is not quite constant in man's class," for "it may be wanting altogether, as in the hedgehog, weasel, porcupine, and others."

† The cat, dog, and other carnivora, says Chauvau's "Comp. Anat. of Domesticated Animals," p. 417.

‡ Man's cæcum is a small reservoir, only  $2\frac{1}{2}$  inches in length; his cæcal appendage is very variable in length, usually about three, it may be six inches long. This variability is significant.

in his own, as in every man's early embryonic development—*his* caecal appendage was, at first, long, of large size, and as wide as the caecum itself, so wide that the small intestine seemed to be inserted into the side of the large intestine, leaving a large pouch-like free end, which, becoming by degrees conical, was gradually constricted and twisted into the adult's familiar, small, and worm-like appendix? Such doubters have no refuge from the scylla of "*derivative creation*," except in the charybdis of "*inscrutable mystery*."

Comparative anatomy has already acquired sufficient knowledge to increase the long list, now given, of the indelible marks of man's lowly origin. As the future perfects this knowledge, not only will there be many important additions, but a brighter light will be thrown on the facts herein presented. However instructive such detailed facts may be, yet, only a fraction of the evidence in favor of evolution depends on human anatomy; and the general facts are as decisive as are details to him thoroughly imbued with a conviction of the simplicity, uniformity, and constancy of nature's laws. For chemistry teaches that man's chemical, microscopy that his histological, morphology that his homological structure, agrees with the whole animal kingdom. Palaeontology has stamped in permanent letters of stone the same succession of animal life, impressed by fleeting hours on the offspring within the womb of every mother; and comparative anatomy, physiology, and pathology, present innumerable general, as well as special facts, to prove—that man, though ultimately formed of those chemical elements, which constitute in part, "*the dust of the ground*," was not formed directly out of these lowly dead inorganics, but had his immediate origin from the very highest organic living matter.





